

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
6 November 2003 (06.11.2003)

PCT

(10) International Publication Number  
WO 03/091863 A2(51) International Patent Classification<sup>7</sup>: G06F 1/00

(21) International Application Number: PCT/JP03/05248

(22) International Filing Date: 24 April 2003 (24.04.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
NO. 2002-127121 26 April 2002 (26.04.2002) JP

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(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

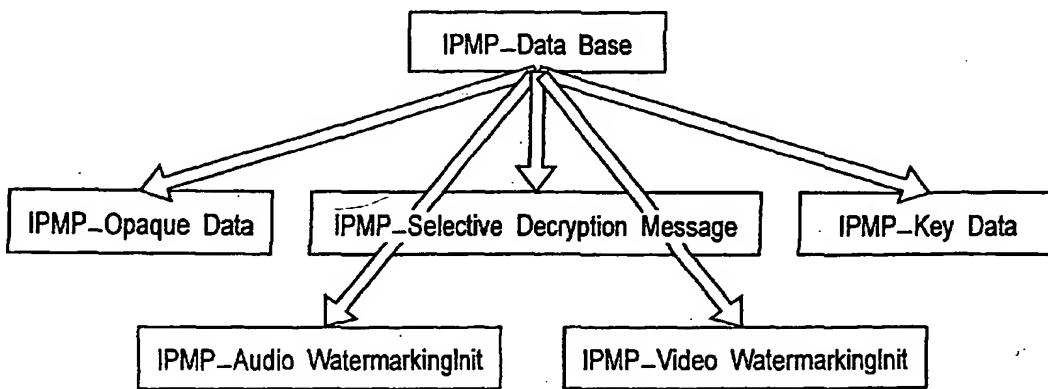
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

## Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHODS OF USE OF IPMP DATA FOR MPEG-N IPMP (INTELLECTUAL PROPERTY MANAGEMENT AND PROTECTION)



(57) Abstract: MPEG-n IPMP system with a wide interoperability is provided. For this purpose, the IPMP\_Data\_BaseClass is defined, several IPMP data extending from this base class are also defined. IPMP data is the data that describes IPMP information, it includes: IPMP\_OpaqueData; IPMP\_SelectiveDecryptionMessage; IPMP\_AudioWatermarkingInit; IPMP\_VideoWatermarkingInit; and IPMP\_KeyData. Places where IPMP data extending from IPMP\_Data\_BaseClass are also specified. With the above work, a IPMP tool from Vendor A will be able to understand the IPMP data constructed by Content Author B, hence the inter-operability will be achieved, that is, the same protected content will be able to be consumed on different vendor's MPEG-n IPMP terminals.

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## DESCRIPTION

## METHODS OF USE OF IPMP DATA FOR MPEG-n IPMP (INTELLECTUAL PROPERTY MANAGEMENT AND PROTECTION)

5

## BACKGROUND OF THE INVENTION

## FIELD OF THE INVENTION

The present invention relates to content distribution and protection, especially to such applications where the protected content based on MPEG-n is consumed by different IPMP terminals, and the same content is protected by different IPMP tools.

## DESCRIPTION OF THE BACKGROUND ART

Content distribution is becoming more and more demanding as multimedia data and contents can reach anywhere and anytime. Users are happy with the convenience and flexibility, and they can enjoy entertainment easily and efficiently. On the other hand, content owners are worried about the illegal usage of their property. There is a balance between two sides.

There are a lot of protection techniques for protecting the content, such as data encryption, watermarking, etc. They have been implemented in many content distribution applications. It seems different system employs different kinds of mechanisms and protection techniques to distribute content with protection. All the terminals or content consuming devices in that case are only able to play and consume the content that is provided by the same content provider. They cannot exchange their terminal or device to playback different

contents.

In MPEG-n context, a standardisation group has been working on MPEG-2,4,7,21 IPMP. The solution is able to achieve both of the following:

1. Allow the same protected content to be consumed on different vendors' MPEG-n IPMP Terminals. This will be fully enabled; and
2. Allow the same content to be protected by different vendors' IPMP Tools.

This will be assisted to as large extent as possible.

The prior art of MPEG-n IPMP is illustrated in Fig. 1.

To achieve such a wide interoperability, IPMP data needs to be standardized. IPMP data is the data that describes IPMP information, it may include time variant key that is carried in IPMP stream, it may also include tool initialisation information, or any data that an IPMP tool needs. However, so far, the standard of MPEG-2, 4, 7, 21 IPMP has not addressed this issue.

Without the standardization of IPMP data, a IPMP tool from Vendor A will not understand the IPMP data constructed by Content Author B, hence the inter-operability will not be achieved, that is, the same protected content will not be able to be consumed on different vendor's MPEG-n IPMP terminals.

## SUMMARY OF THE INVENTION

To solve the problem, to assure a clear and interoperable standard, the IPMP\_Data\_BaseClass is defined, several IPMP data extending from this base class are also defined, which include IPMP opaque data, audio watermarking tool initialisation information, video watermarking tool initialisation information, IPMP key stream, etc.

In a first aspect of the invention, a method of using IPMP Data in MPEG-

2 IPMP system, at the content author side comprises the following steps of:

Constructing IPMP data extending from IPMP\_Data\_BaseClass,  
following the defined IPMP data syntax;

Carry the IPMP data in IPMP Descriptor in IPMP Control Graph

5 which is subsequently carried in PSI.

In a second aspect of the invention, a method of using IPMP Data in  
MPEG-2 IPMP system, at the content author side comprises the following steps  
of:

Constructing IPMP data extending from IPMP\_Data\_BaseClass,  
10 following the defined IPMP data syntax;

Carry the IPMP data in IPMP Stream, the IPMP data is wrapped in  
Stream Data Update which has a destination address indicating which tool the  
IPMP data should be sent to.

In a third aspect of the invention, a method of using IPMP Data in MPEG-  
15 2 IPMP system, at the IPMP terminal side, comprises the following steps of:

The IPMP terminal extracts the IPMP Descriptor containing the IPMP  
data from the content stream;

The IPMP terminal delivers the IPMP Descriptor containing the IPMP  
data to the specific tool which is also indicated in IPMP Descriptor by the means  
20 of IPMP Tool ID;

The IPMP tool, upon receiving of such a IPMP Data, interprets it  
according to the specific IPMP data syntax, and act upon it.

In a fourth aspect of the invention, a method of using IPMP Data in  
MPEG-2 IPMP system, at the IPMP terminal side is provided. The method  
25 comprises the following steps of:

The IPMP terminal demultiplexes the IPMP Stream containing the IPMP data from the content stream;

The IPMP terminal delivers each IPMP\_StreamDataUpdate containing the IPMP data to the specific tool whose address is indicated in the above mentioned IPMP\_StreamDataUpdate;

The IPMP tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

In a fifth aspect of the invention, a method of using IPMP Data in MPEG-4 IPMP system, at the content author side comprises the following steps of:

10 Constructing IPMP data extending from IPMP\_Data\_BaseClass, following the defined IPMP data syntax;

Carry the IPMP data in IPMP\_Tool\_Descriptor in OD stream.

In a sixth aspect of the invention, a method of using IPMP Data in MPEG-4 IPMP system, at the content author side, comprises the following steps of:

15 Constructing IPMP data extending from IPMP\_Data\_BaseClass, following the defined IPMP data syntax;

Carry the IPMP data in IPMP\_Initialize which is subsequently carried in IPMP\_Tool\_Descriptor in OD stream.

20 In a seventh aspect of the invention, a method of using IPMP Data in MPEG-4 IPMP system, at the content author side, comprises the following steps of:

Constructing IPMP data extending from IPMP\_Data\_BaseClass, following the defined IPMP data syntax;

25 Carry the IPMP data in IPMP Stream, the IPMP data is wrapped in

IPMP\_StreamDataUpdate which has a destination address indicating which tool the IPMP data should be sent to.

In an eighth aspect of the invention, a method of using IPMP Data in MPEG-4 IPMP system, at the IPMP terminal side, comprises the following steps 5 of:

The IPMP terminal extracts the IPMP\_Tool\_Descriptor containing the IPMP data from the content stream;

The IPMP terminal delivers the IPMP\_Tool\_Descriptor containing the IPMP data to the specific tool which is also indicated in IPMP\_Tool\_Descriptor 10 by the means of IPMP Tool ID in IPMP\_Tool\_Descriptor;

The IPMP tool, upon receiving of such a IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

In a ninth aspect of the invention, a method of using IPMP Data in MPEG-4 IPMP system, at the IPMP terminal side, comprises the following steps 15 of:

The IPMP terminal extracts the IPMP\_Initialize containing the IPMP data from the IPMP\_Tool\_Descriptor from the content stream;

The IPMP terminal delivers the IPMP\_Tool\_Descriptor containing the above mentioned IPMP\_Initialize which subsequently carries IPMP data to the 20 specific tool which is also indicated by the means of IPMP Tool ID in IPMP\_Tool\_Descriptor;

The IPMP tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

In a tenth aspect of the invention, a method of using IPMP Data in 25 MPEG-4 IPMP system, at the IPMP terminal side, comprises the following steps

of:

The IPMP terminal extracts the IPMP\_StreamDataUpdate containing the IPMP data from the IPMP Stream from the content stream;

5 The IPMP terminal delivers the IPMP\_StreamDataUpdate containing the above mentioned IPMP data to the specific tool which is also indicated in IPMP\_StreamDataUpdate by the means of IPMP\_ToolDescriptorID;

The IPMP tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

10 In an eleventh aspect of the invention, a method of using IPMP Data in MPEG-n IPMP system, at the content author side, comprises the following steps of:

Constructing IPMP data extending from some IPMP data base class, following the defined IPMP data syntax;

15 Carry the IPMP data in defined position in the MPEG-n IPMP content stream;

In a twelfth aspect of the invention, a method of using IPMP Data in MPEG-n IPMP system, at the IPMP terminal side, comprises the following steps of:

20 The IPMP terminal extracts the IPMP Data from the defined position in the content stream;

The IPMP terminal delivers the IPMP Data to the specific tool which is also indicated by the means of IPMP Tool ID associated with the IPMP Data;

The IPMP tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

25 In a thirteenth aspect of the invention, a Method of using IPMP video

watermarking tool in MPEG-n IPMP system, at the IPMP terminal side, comprises the following steps of:

The IPMP terminal extracts the IPMP video watermarking initialization data from the defined position in the content stream;

5 The IPMP terminal delivers the IPMP video watermarking initialization data to the specific video watermarking tool which is also indicated by the means of IPMP Tool ID associated with the IPMP Data;

The IPMP video watermarking tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it;

10 The IPMP video watermarking tool, when detecting a watermark from the video stream, notifies the terminal using IPMP\_SendVideoWatermark message.

#### BRIEF DESCRIPTION OF THE DRAWINGS

This and other objects and features of the present invention will become clear from the subsequent description of a preferred embodiment thereof made with reference to the accompanying drawings, in which like parts are designated by like reference numerals and in which:

Fig. 1 is a diagram showing IPMP architecture for generic IPMP as the prior art;

20 Fig. 2 is a diagram showing the types of IPMP data extending from IPMP\_DataBase;

Fig. 3 is a diagram showing the places to carry IPMP data in MPEG-2 IPMP content; and

25 Fig. 4 is a diagram showing how MPEG-2 IPMP terminal processes IPMP protected MPEG-2 content using IPMP data.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 2 illustrates the defined IPMP data extending from IPMP\_Data\_BaseClass. Places where IPMP data extending from IPMP\_Data\_BaseClass are also specified.

IPMP\_DataBase defined as IPMP\_Data\_BaseClass includes information for using IPMP tool(s). The information is necessary to detect digital wartermarks and to decode content. Such information is managed in register of the IPMP system and is retrieved when processing the content.

IPMP\_Data\_BaseClass is described in predetermined syntax as shown in "Syntax" of "IPMP\_Data\_BaseClass" below. In order to achieve a flexible and interoperable IPMP system structure for MPEG-n and other applications as described above, we should be able to allow the followings.

1. Fix the syntax of various commonly used IPMP data, that includes:

- 15 a. IPMP opaque data;
- b. IPMP decryption configuration data;
- c. IPMP audio watermarking configuration data;
- d. IPMP video watermarking configuration data; and
- e. IPMP key stream.

20 2. Fix the position of where the IPMP data should be carried in the MPEG-n content which is protected by IPMP.

Only when all above are fixed, the interoperable IPMP system for MPEG-n can be fully achieved.

Detailed explanations on items a to e will be described later.

25 Fig. 3 illustrates the places to carry IPMP data in MPEG-2 IPMP content.

3.1 is the place in IPMP stream, where IPMP data can be carried in IPMP\_info\_message which will then form the IPMP elementary stream. IPMP\_KeyData can be carried in this place. 3.2 is the place in IPMP Descriptor which is subsequently carried in IPMP Control Graph Descriptor in PSI, tool 5 initialisation data can be carried in this place.

IPMP Data is carried in the IPMP protected content bitstream (MPEG-2, 4, 7, 21). The base class is defined as IPMP\_Data\_BaseClass.

IPMP data that are all extended from IPMP\_Data\_BaseClass include:

the IPMP\_AudioWatermarkingInit;

10 IPMP\_SelectiveDecryptionMessage;

IPMP\_VideoWatermarkingInit;

IPMP\_KeyData; and

IPMP\_OpaqueData.

## 15 IPMP\_Data\_BaseClass

### Syntax

```
Aligned(8) expandable(228-1)class IPMP_Data_BaseClass{
```

```
    bit(8) Version;
```

```
    bit(8) IPMP_DataTag;
```

```
20 }
```

### Semantics

Version indicates the version of syntax used in the IPMP Data and shall be set to 0x01.

25 IPMP\_DataTag indicates the tag for the extended IPMP data. The exact

values for the extension tags are defined in the following table.

Table 1- Tags for messages extending IPMP\_ToolMessageBase

8-bit Tag Value	Symbolic Name
0x00	Forbidden
0x01	IPMP_OpaqueData_tag
0x02	IPMP_SelectiveDecryptionMessage_tag
0x03	IPMP_AudioWatermarkingInit_tag
0x04	IPMP_VideoWatermarkingInit_tag
0x05	IPMP_KeyData_tag <-> IPMP_RightsData_tag
0x06 – 0xCF	ISO Reserved
0xD0 – 0xFE	User Defined
0xFF	Forbidden

Places to carry IPMP Data extended from IPMP\_Data\_BaseClass

5 IPMP Data extending from IPMP\_Data\_BaseClass could be carried in the following two places:

- IPMP\_Descriptor class (MPEG-2 system)
- IPMP\_info\_message class which is subsequently carried in IPMP Stream.

(MPEG-2 system)

10 - IPMP\_Tool\_Descriptor class (MPEG-4 system)

- IPMP\_Initialize which is subsequently carried in IPMP\_Tool\_Descriptor class (MPEG-4 system)
- IPMP\_StreamDataUpdate which is subsequently carried in IPMP Stream.

(MPEG-4 system).

15 In MPEG-2 system case, the IPMP\_Descriptor and IPMP\_info\_message need modifications as below:

## IPMP\_Descriptor

The new syntax for this should be:

Table 2 – IPMP Descriptor

Syntax	No. of bits	Mnemonic
0 <b>IPMP_descriptor()</b> {		
<b>descriptor_tag</b>	8	Uimsbf
<b>descriptor_length</b>	8	Uimsbf
<b>IPMP_DescriptorID</b>	8	Uimsbf
<b>IPMP_ToolID</b>	128	Uimsbf
<b>numControlPoints</b>	8	uimsbf
for ( i=0; i<numControlPoints;		
i++) {		
<b>controlPoint</b>	8	uimsbf
<b>sequenceCode</b>	8	uimsbf
<b>IPMP_Data_length</b>	16	uimsbf
for ( i=0; i< N;		
i++) {		
<b>IPMP_Data</b>		
}		
}		
}		

where the **IPMP\_Data** is the IPMP Data extended from **IPMP\_Data\_BaseClass**.

## 5    IPMP\_StreamDataUpdate

The IPMP Stream should be a concatenation of IPMP Stream Data Update, with the new syntax defined below.

Table 3 IPMP\_StreamDataUpdate

Syntax	No. of bits	Mnemonic
IPMP_info_message()		
IPMP_descriptor_id	8	uimsbf
control_point	8	uimsbf
length_of_message	16	uimsbf
IPMP_Data_length	16	uimsbf
for ( i=0; i<N; i++) {		
IPMP_data	8	uimsbf
}		
}		

where the IPMP\_Data is the IPMP Data extended from IPMP\_Data\_BaseClass.

IPMP\_StreamDataUpdate has a destination address indicating which tool the IPMP data should be sent to.

5. Types of IPMP Data that extends from IPMP\_Data\_BaseClass

Opaque Data

Opaque Data can contain various information depending on respective users, cases and so on.

There are many cases where opaque data may be needed for certain tools. Hence IPMP\_OpaqueData\_tag = 0x01 is reserved for carriage of opaque data. The syntax is illustrated below.

```

class IPMP_OpaqueData extends IPMP_Data_BaseClass
: bit(8) tag = IPMP_OpaqueData_tag
15  {
    ByteArray opaqueData;
}

```

### Selective Decryption Configuration Message

Selective Decryption Configuration Message specifies portions in the IPMP Stream, where the stream is encrypted.

5        The class `IPMP_SelectiveDecryptionMessage` should now be extended from `IPMP_Data_BaseClass` instead of `IPMP_ToolMessageBase`. The tag for this class should be `IPMP_SelectiveDecryptionMessage_Tag` as defined in the above table for `IPMP_Data_BaseClass` tags.

### 10      Audio Watermarking Configuration Message

Audio Watermarking Configuration Message specifies an initial value to detect watermarks added on an audio stream.

15       The class `IPMP_AudioWatermarkingInit` should now be extended from `IPMP_Data_BaseClass` instead of `IPMP_ToolMessageBase`. The tag for this class should be `IPMP_AudioWatermarkingInit_Tag` as defined in the above table for `IPMP_Data_BaseClass` tags.

20       See "MPEG -2 IPMP", ISO/IEC 13818-1:2000 PDAM2, March, 2002, and "MPEG -4 IPMP Extension", FPDAM ISO/IEC 14496-1:2001 / AMD3, March, 2002.

### IPMP Key Data

25       The `IPMP_KeyData` is defined to extend from `IPMP_Data_BaseClass`. This IPMP data could possibly be carried in `IPMP_info_message` which is subsequently carried in IPMP Stream. This facilitates the time variant key

carried in IPMP Stream.

### Syntax

```
class IPMP_KeyData extends IPMP_Data_BaseClass :  
5    bit(8) tag = IPMP_KeyData_tag  
    {  
        ByteArray keyBody;  
        bit(1) isTimeScheduled;  
        const bit(7) reserved = 0b0000000;  
10    if (isTimeScheduled)  
        {  
            bit(33) PTS;  
            const bit(7) reserved = 0b0000000;  
        }  
15    ByteArray OpaqueData;  
    }
```

### Semantics

keyBody – the body of the key. The value shall be data that conforms to  
20 a rule for data structure of the key defined outside of this document.

IsTimeScheduled – Specify if the key is scheduled to be active at a certain PTS value. If this value is set to 1, there should be a PTS value followed indicating the activation time.

OpaqueData – Any other opaque data carried in this IPMP data.

### Video Watermarking Configuration Message

Video Watermarking Configuration Message specifies an initial value to detect watermarks added on a video stream. IPMP\_VideoWatermarkingInit data is used to initialise a Watermarking Tool about the process of insertion/extraction of the watermarking payload into/from a video stream.

#### Syntax

```
class IPMP_VideoWatermarkingInit extends IPMP_Data_BaseClass :  
    bit(8) tag = IPMP_VideoWatermarkingInit_tag  
10    {  
        bit(8) inputFormat;  
        bit(4) requiredOp;  
        bit(1) hasOpaqueData;  
        const bit(3) reserved = 0b000;  
15    if (inputFormat == YUV)  
        {  
            bit(16) frame_horizontal_size;  
            bit(16) frame_vertical_size;  
20        bit(8) chroma_format;  
        }  
  
        if ((requiredOp == INSERT_WM)|| (requiredOp == REMARK_WM))  
        {  
            bit(16) wmPayloadLen;
```

```
    bit(8) wmPayload[wmPayloadLen];  
}  
  
if ((requiredOp == EXTRACT_WM))  
5 {  
    bit(16) wmRecipientId;  
}  
  
if (hasOpaqueData)  
10 {  
    bit(16) opaqueDataSize;  
    bit(8) opaqueData[opaqueDataSize];  
}  
}  
15
```

### Semantics

The IPMP\_videoWatermarkingInit data delivers to a watermarking tool all the information about the characteristics of the video content, the type of action to be performed on it and, possibly other related proprietary data required by 20 the watermarking tool. Furthermore in case of:

- insertion, the watermarking payload to be inserted;
- extraction, the ID of the recipient of the watermarking payload is provided;
- remarking, the watermarking payload to be inserted.

- **inputFormat:** The format of the video input stream, as indicated in a Table to be maintained by a registration authority. The Table shall contain at least all video formats indicated in Table 8 “ObjectTypeIndication values” in [3]
- **RequiredOp:** The operation that the watermarking tool is required to perform on the audio stream. The following values are allowed: **INSERT\_WM** = 0**EXTRACT\_WM**=1**REMARK\_WM** =2**ISO reserved** = 3..10**User defined** = 11..15
- **frame\_horizontal\_size:** Horizontal size of the yuv frame
- **frame\_vertical\_size:** vertical size of the yuv frame
- **chroma\_format:** chroma\_format: 0x01=4:2:0, 0x02=4:2:2, 0x03=4:4:4, ISO reserved =0x04..0xA0, User defined = 0xA1..0xFE, Forbidden: 0x00, 0xFF
- **WmPayloadLen:** the length of the watermarking payload in bytes to be inserted in the video content.
- **WmPayload:** the watermarking payload to be inserted in the video content
- **WmRecipientId:** the address of the destination tool, to which the watermarking payload and compression information must be delivered.
- **HasOpaqueData:** a flag that indicates if the message also carries opaque data information for the watermarking tool.
- **OpaqueDataSize:** the length of the opaque data field in bytes
- **OpaqueData:** the opaque data field carrying proprietary information to the watermarking tool (e.g. initialisation parameters, like specific algorithm id, keys, etc. )

25 **IPMP\_SendVideoWatermark Message**

The Watermarking Tool receives the video stream and in case of watermarking extraction, replies with an IPMP\_SendVideoWatermark message carrying the watermarking payload.

## 5 Syntax

```
class IPMP_SendVideoWatermark extends IPMP_ToolMessageBase :  
    bit(8) tag = IPMP_SendVideoWatermark_tag  
{  
    bit(4) wm_status;  
10    bit(1) hasOpaqueData;  
    bit(3) reserved = 0b000;  
    if (wm_status == WM_PAYLOAD)  
    {  
        ByteArray payload;  
15    }  
    if (hasOpaqueData)  
    {  
        ByteArray opaqueData;  
    }  
20    }
```

## Sémantics

A watermarking tool, which has been required to perform payload extraction by means of an IPMP\_VideoWatermarkInit will send this message to `wmRecipientId` each time a new watermarking payload is extracted from the

videocontent.

- wm\_status: the result of the check if watermarking was present.

If watermark was detected, then this value also says if the payload extracted is carried inside the message or not. Possible values are listed in the wm\_status table below.

- hasOpaqueData: a flag indicating whether this message carries opaque data.

- payload: the watermarking payload extracted from the video content.

- opaqueData: opaque data from the Watermarking Tool.

#### wm\_status table

- WM\_PAYLOAD: Watermarking was present in the video stream, payload is carried in the message.

- WM\_NOPAYLOAD: Watermarking was present in the video stream, no payload is carried in the message.

- NO\_WM: Watermarking was not present in the video stream.

- WM\_UNKNOWN: The Watermarking Tool was unable to detect whether watermarking was present in the video stream or not.

Referring now to Fig. 3, adaptation of the information contained in IPMP DataBase is described next. Fig. 3 shows flows of information in a server which provides a terminal with a IPMP protected content. In this Figure, Program Specific Information ("PSI") and "IPMP Protected MPEG-2 Content"

are finally obtained and provided for the terminal. PSI describes, for example, one or more types of scrambling scheme and existence of watermarks. One PSI may be created for each content, or for a plurality of content.

IPMP\_OpaqueData is set in IPMP Control Information in PSI.

5 The three types of information "IPMP\_SelectiveDecryptionMessage", "IPMP\_AudioWatermarkingInit", and "IPMP\_VideoWatermarkingInit" are defined in IPMP\_Info, where IPMP data is carried. The above three types of information are incorporated in IPMP\_Control\_Graph and then set in Program Map Table (PMT).

10 "IPMP\_KeyData" forms a part of IPMP information, which contains data on one or more keys for descrambling the content. "IPMP\_KeyData" may be varied dependent on time. A header is added to IPMP information to be incorporated in "IPMP Stream" in the Content Stream, where IPMP data is carried.

15 Based on the IPMP\_Data\_BaseClass, some useful IPMP data syntax were clearly defined. Suppose the content's video stream is encrypted by IPMP AES tool A, the content author can clearly define an AES tool initialisation information using IPMP\_SelectiveDecryptionMessage extending from IPMP\_Data\_BaseClass. The initialization information may include block size, 20 encryption method. The entire IPMP\_SelectiveDecryptionMessage can be carried in IPMP Descriptor (in MPEG-2 IPMP case) or IPMP\_Tool\_Descriptor (in MPEG-4 IPMP case), as illustrated by 4.1 in Fig. 4.

25 The video stream may be encrypted by a time variant key stream. In this case, the content author constructs IPMP\_KeyData extending from IPMP\_Data\_BaseClass which includes the time variant key. The

IPMP\_KeyData is carried in IPMP Stream, as illustrated by 4.2 in Fig. 4.

The AES tool vendor can then conform to the same standard, and develop a AES Decryption tool A (as illustrated in Fig. 4) that can understand the IPMP\_SelectiveDecryptionMessage coming from IPMP\_Descriptor or IPMP\_Tool\_Descriptor in the content stream.

Suppose the content's video stream is watermarked by IPMP Video Watermarking tool B, the content author can clearly define a video watermarking tool initialisation information using IPMP\_VideoWatermarkingInit extending from IPMP\_Data\_BaseClass. The initialization information may include chroma format, frame size, watermark payload to be inserted, whether to insert or extract watermark, etc. The entire IPMP\_VideoWatermarkingInit can be carried in IPMP Descriptor (in MPEG-2 IPMP case) or IPMP\_Tool\_Descriptor (in MPEG-4 IPMP case), as illustrated by 4.3 in Fig. 4.

The video watermarking tool vendor can then conform to the same standard, and develop a video watermark tool B (as illustrated in Fig. 4) that can understand the IPMP\_VideoWatermarkingInit coming from IPMP\_Descriptor or IPMP\_Tool\_Descriptor in the content stream.

At the terminal side, when the terminal receives the content stream, it retrieves the IPMP Descriptor from IPMP Control Graph in MPEG-2's PSI. The IPMP Descriptor containing the IPMP\_SelectiveDecryptionMessage is delivered to the AES decryption tool A as illustrated by 4.4 in Fig. 4. AES decryption tool receives this IPMP data, parses it according to the defined syntax, and configures itself.

The IPMP Descriptor containing the IPMP\_VideoWatermarkingInit is delivered to the video watermarking tool B as illustrated by 4.5 in Fig. 4. Video

watermarking tool B receives this IPMP data, parses it according to the defined syntax, and configures itself.

When the content flows it, the MPEG-2 terminal's demultiplexer retrieves IPMP data which contains the time variant key from IPMP stream. It delivers 5 this IPMP Data to AES decryption tool A as illustrated by 4.6 in Fig. 4. Tool A receives this IPMP\_KeyData, and uses the new time variant key to decrypt the video elementary stream.

The video watermarking tool receives the video stream and in case of 10 watermarking extraction, replies with an IPMP\_SendVideoWatermark message carrying the watermarking payload as illustrated by 4.7 in Fig. 4.

With the above mentioned embodiment, by constructing a data base which contains information to be used to inform the MPEG-2 IPMP terminal what kind of content protection tool is used, what kind of watermarking tool is used, or what kind of encryption key is used, the interoperability between the 15 protected-content provided and this receiver can be realized and any MPEG-n IPMP terminal can decrypt the contents sent from a content provider together with the IPMP stream or IPMP control information or IPMP control graph.

## CLAIMS

1. A method of using IPMP Data in IPMP system, at the content author side, comprising:
  - 5 Constructing a database which contains information to be used for IPMP tool required to process and protect content;
    - Creating an IPMP data from the information contained in the database;
    - Adding the IPMP data to the content to create IPMP Protected content.
  2. The Method of using IPMP Data in IPMP system according to claim 1, at 10 the content author side,
    - wherein the IPMP data is constructed by extracting information from the database based on a defined IPMP data syntax.
  3. The Method of using IPMP Data in IPMP system according to claim 2, at 15 the content author side, further comprising carrying the IPMP data in IPMP Descriptor in IPMP Control Graph, which is subsequently carried in PSI.
  4. The Method of using IPMP Data in IPMP system according to claim 2, at the content author side, wherein the IPMP data is wrapped in IPMP\_StreamDataUpdate which has a destination address indicating which tool the IPMP data should be sent to.
  - 20 5. The Method of using IPMP Data in IPMP system according to claim 1, wherein the IPMP Protected content is MPEG-2 content.
  6. The Method of using IPMP Data in IPMP system according to claim 2, 25 wherein the IPMP Protected content is MPEG-4 content, and wherein the method further comprises Carrying the IPMP data in IPMP\_Tool\_Descriptor in OD stream.

7. The Method of using IPMP Data in IPMP system according to claim 2, wherein the IPMP Protected content is MPEG-4 content, and wherein the method further comprises Carrying the IPMP data in IPMP\_Initialize which is subsequently carried in IPMP\_Tool\_Descriptor in OD stream.
- 5 8. The Method of using IPMP Data in IPMP system according to claim 2, wherein the IPMP Protected content is MPEG-4 content, and wherein the method further comprises Carrying the IPMP data in IPMP Stream, which is wrapped in IPMP\_StreamDataUpdate which has a destination address indicating which tool the IPMP data should be sent to.
- 10 9. The Method of using IPMP Data in IPMP system according to claim 2, wherein the IPMP Protected content is MPEG-n content, and wherein the method further comprises Carrying the IPMP data in defined position in the MPEG-n IPMP content stream.
- 15 10. A Method of using IPMP Data in IPMP system, at the IPMP terminal side, comprising:
  - Extracting IPMP Descriptor containing IPMP data from IPMP Protected content; and
  - Delivering IPMP Descriptor containing the IPMP data to a IPMP tool which is also indicated in IPMP Descriptor by the means of IPMP Tool ID, wherein the IPMP tool, upon receiving of such a IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.
- 20 11. A Method of using IPMP Data in IPMP system, at the IPMP terminal side, according to claim 10, further comprising:
  - Demultiplexing the IPMP Stream containing the IPMP data from the

IPMP Protected content; and

Delivering each IPMP\_StreamDataUpdate containing the IPMP data to the IPMP tool whose address is indicated in the above mentioned IPMP\_StreamDataUpdate,

5 wherein the IPMP tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

12. A Method of using IPMP Data in IPMP system, at the IPMP terminal side, according to claim 10, wherein the IPMP Protected content is MPEG-2 content.

13. A Method of using IPMP Data in IPMP system, at the IPMP terminal side, 10 according to claim 12, further comprising:

Extracts the IPMP\_Tool\_Descriptor containing the IPMP data from the IPMP Protected content; and

15 Delivering the IPMP\_Tool\_Descriptor containing the IPMP data to the IPMP tool which is also indicated in IPMP\_Tool\_Descriptor by the means of IPMP Tool ID in IPMP\_Tool\_Descriptor,

wherein the IPMP tool, upon receiving of such a IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

14. A Method of using IPMP Data in IPMP system, at the IPMP terminal side, according to claim 10,

20 wherein the IPMP Protected content is MPEG-4 content,

wherein the method further comprises:

Extracts the IPMP\_Initialize containing the IPMP data from the IPMP\_Tool\_Descriptor from the IPMP Protected content;

25 Delivering the IPMP\_Tool\_Descriptor containing the above mentioned IPMP\_Initialize which subsequently carries IPMP data to the IPMP tool which is

also indicated by the means of IPMP Tool ID in IPMP\_Tool\_Descriptor,

wherein the IPMP tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

15. A Method of using IPMP Data in IPMP system, at the IPMP terminal side, according to claim 10,

5 wherein the IPMP Protected content is MPEG-4 content,

wherein the method further comprises:

Extracts the IPMP\_StreamDataUpdate containing the IPMP data from the IPMP Stream from the IPMP Protected content;

10 Delivering the IPMP\_StreamDataUpdate containing the above mentioned IPMP data to the specific tool which is also indicated in IPMP\_StreamDataUpdate by the means of IPMP\_ToolDescriptorID, and

wherein the IPMP tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

15 16. A Method of using IPMP Data in IPMP system, at the IPMP terminal side, according to claim 10,

wherein the IPMP Protected content is MPEG-n content,

wherein the method further comprises:

Extracting the IPMP Data from the defined position in the IPMP Protected 20 content; and

Delivering the IPMP Data to the IPMP tool which is also indicated by the means of IPMP Tool ID associated with the IPMP Data,

wherein the IPMP tool, upon receiving of such an IPMP Data, interprets it according to the specific IPMP data syntax, and act upon it.

25 17. A Method of using IPMP Data in IPMP system, at the IPMP terminal side,

according to claim 10,

wherein the IPMP Protected content is MPEG-n content,

wherein the method further comprises:

Extracting the IPMP video watermarking initialization data from the  
5 defined position in the IPMP Protected content; and

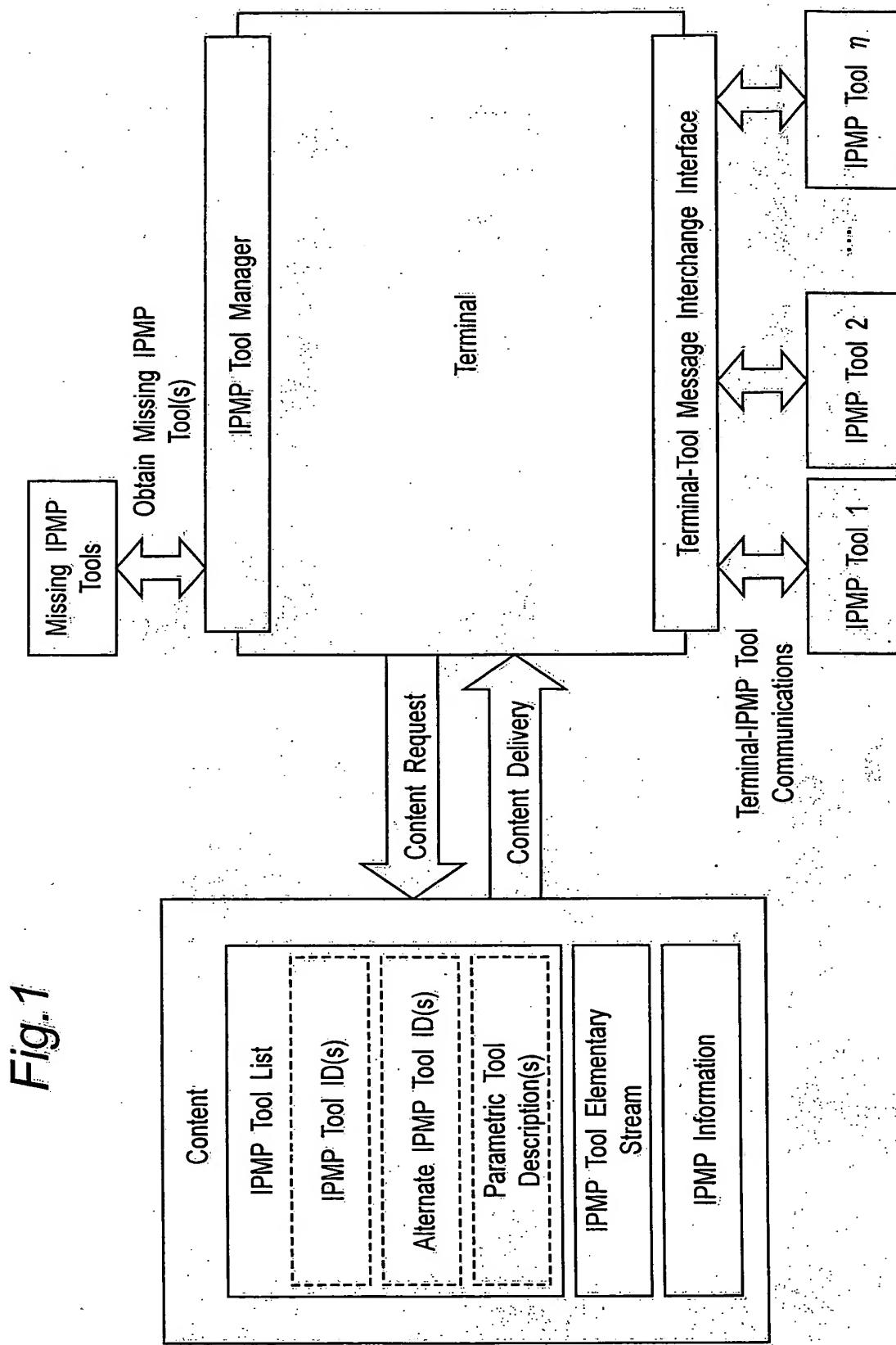
Delivering the IPMP video watermarking initialization data to the specific  
video watermarking tool which is also indicated by the means of IPMP Tool ID  
associated with the IPMP Data,

wherein the IPMP video watermarking tool, upon receiving of such an  
10 IPMP Data, interprets it according to the specific IPMP data syntax, and act  
upon it, and

wherein the IPMP video watermarking tool, when detecting a watermark  
from the video stream, notifies the terminal using IPMP\_SendVideoWatermark  
message.

## ABSTRACT

MPEG-n IPMP system with a wide interoperability is provided. For this purpose, the IPMP\_Data\_BaseClass is defined, several IPMP data extending from this base class are also defined. IPMP data is the data that describes IPMP information, it includes: IPMP\_OpaqueData; IPMP\_SelectiveDecryptionMessage; IPMP\_AudioWatermarkingInit; IPMP\_VideoWatermarkingInit; and IPMP\_KeyData. Places where IPMP data extending from IPMP\_Data\_BaseClass are also specified. With the above work, a IPMP tool from Vendor A will be able to understand the IPMP data constructed by Content Author B, hence the interoperability will be achieved, that is, the same protected content will be able to be consumed on different vendor's MPEG-n IPMP terminals.



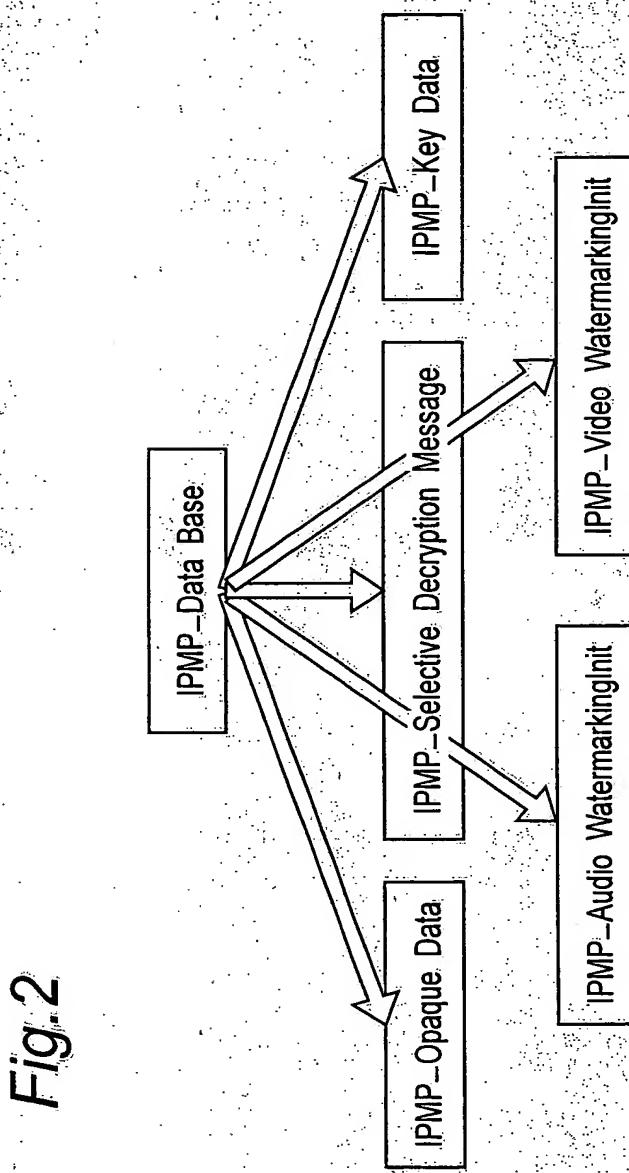


Fig.2

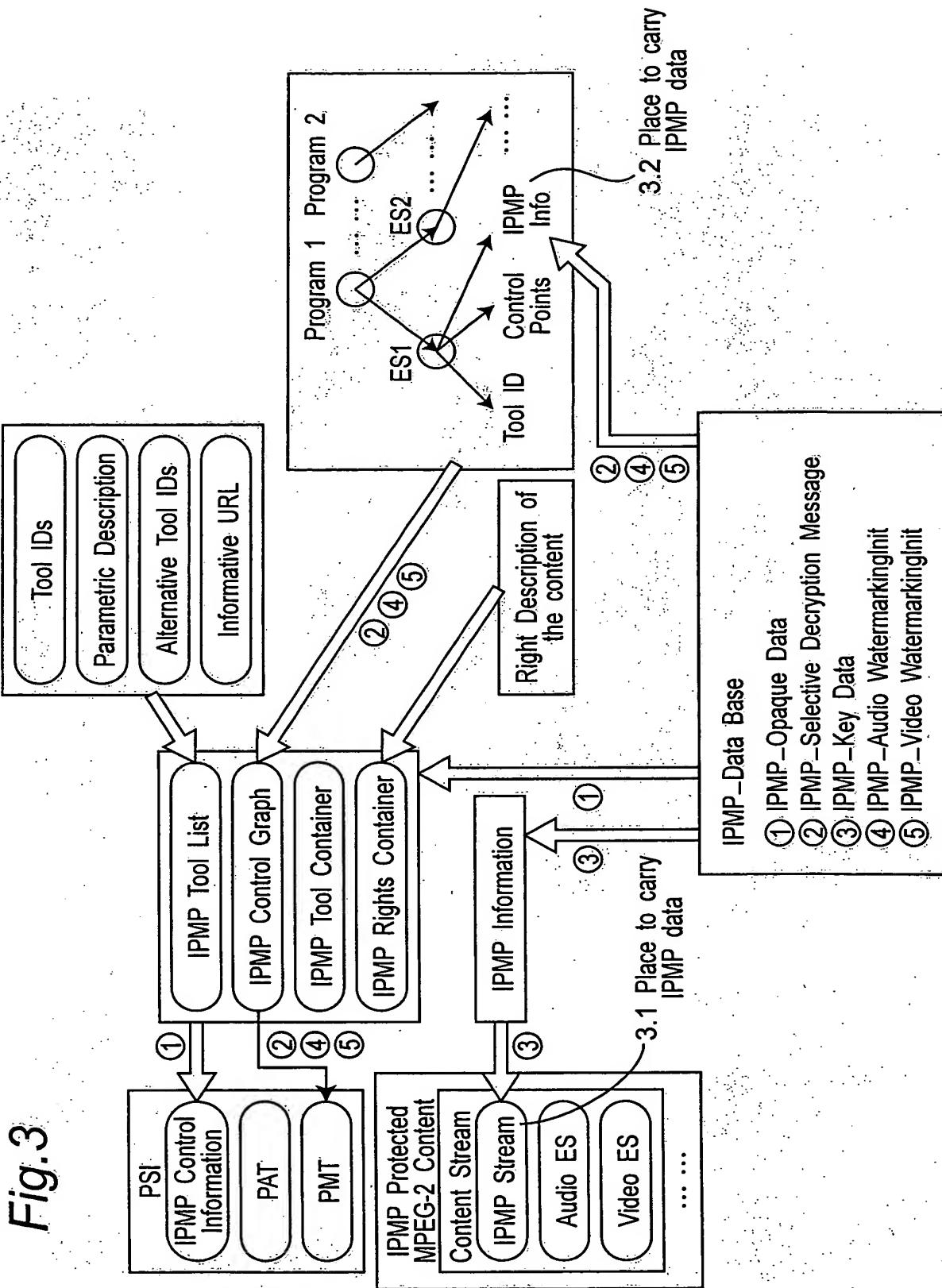


Fig. 4

## 4.1 Carry IPMP-Key Data in the IPMP Stream

